Weight Gain on an Elevator Ride

To study how weight apparently changes while on an elevator we will look at a 100kg man in an elevator.

Case 1: The elevator accelerates upwards at $3.0\ m/s^2$.

$m = 100\ kg$
$a = 3.0\ m/s^2$
$g = -9.81\ m/s^2$

① Find F_g or weight of the man

$F_g = mg$
$= 100kg \times 9.81\ m/s^2$
$= 981\ N$

② Find F_{net} of the elevator

$F_{net} = ma$
$= 100kg \times 3.0\ m/s^2$
$= 300N$

③ Will he feel lighter or heavier?

Add or Subtract F_{net} from F_g

F_{scales} or $F_N = F_g \oplus F_{net}$
$= 981N + 300N$
$= 1281N$

Case 2: The elevator moves at a constant velocity.

$a = 0$

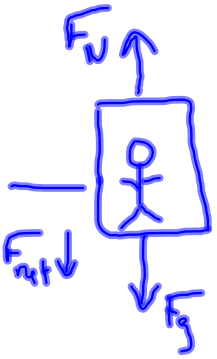
$F_{net} = 0$

100 kg man weighs? $F_g = mg$

$= 100\,kg \times 9.81\,m/s^2$

$= 981\,N$

Case 3: The elevator starts to accelerate downward at $30\ m/s^2$



① Calculate F_g

$F_g = mg$
$= 981\ N$

② Calculate F_{net}

$F_{net} = ma$
$= 300\ N$

③ This time we will (−) F_{net} because he will feel lighter

F_{scales} or $F_N = F_g \ominus F_{net}$
$= 981\ N - 300\ N$
$= 681\ N$

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Tension is the upward force = F_{scales} or F_N
F_T = Force of Tension